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Radio Frequency Identification (RFID) Application as Anti-Human Trafficking Measure (AHTM)

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Abstract—Whenever there is human mobility due to natural or political disasters (floods, earthquakes, wars, etc.) in underdeveloped countries, increased human trafficking for commercial sexual exploitation is observed. Since Radio Frequency Identification (RFID) technology is continue to multiply in our daily life, this paper presents the possible use of RFID to suppress human trafficking. As RFID technology is being leveraged from vehicle registration to animal tagging in identification management systems, it could be a very efficient and cost effective tool to introduce information technology as a novel Anti-Human Trafficking Measure (AHTM). A detailed system design is proposed in this paper. Moreover the prominent concerns regarding this application are also discussed. Though the benefit to risks ratio could not be precisely calculated in short run but these dilemmas are naturally less sore as compare to human trafficking.

Keywords— Anti-Human Trafficking Measure, AHTM, RFID, RFID, Human Implant.

I. INTRODUCTION

UNITED States Government data [1] reflects that nearly eight hundred thousand persons around the world trafficked each year across international borders. Furthermore it is estimated that 80 percent of victims are women and girls and nearly 50 percent are minors. It has also been estimated that majority of victims are forced into commercial sexual exploitation. Although RFID is a dedicated short range communication technology, this study proposes a preliminary strategic idea to combat international trafficking by using RFID technology. The motivation presented in this study is implanting 'RFID tags' to potential

victims and placing the 'Readers' at international and/or domestic borders.

This study is organized as follows: Recent events and incidences of human trafficking to identify the future potential victims are discussed in section II. This section represents the natural and political disaster events when huge human trafficking is observed. Section III illustrates the use of Information Technology (IT) as Anti-Human Trafficking Measure (AHTM).

Section IV represents the basics of RFID technology and its increasing applications in daily life. Historical background of RFID human implants is also discussed. The proposed RFID system design as AHTM is covered in section V. Main components of proposed system along with the procedure to implant RFID tags in potential victims are discussed in this section. In section VI, the technical limitations and health concerns of the system and ethical dilemmas associated with RFID implants in humans are discussed. The study is concluded and benefit to risk ratio is discussed in the last section.

II. EVENTS AND INCIDENCES OF HUMAN TRAFFICKING

Human Trafficking is observed in many incidents and events that occur due to the human created tragedies or natural disasters. As a result of human trafficking, millions of people are dump in forced labor and sexual exploitation [2]. There are various ways of exploitation of victims depending upon social and political conditions of different world regions. Children are trafficked for a number of purposes like adoption, sexual abuse, camel racing, organ trade, begging, and criminal work like selling drugs. The events resulting in increase of human trafficking which became the motivation of this study include the following:

A. Recent Wars

Recent wars in Afghanistan and Iraq cause people suffering from modern slavery. Particularly Afghanistan is not only considered as source but also destination of human trafficking due to poor economic and social conditions lead by war span over large interval of time.

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B. Poor Law and Order Situation

Countries having discrimination in law on the basis of gender difference is also notified as increase in trafficking. Poor families with lack of education consider girls as source of income by selling them to the traffickers [3]. Since the victims and families are unaware of their fate and remain calm, the law enforcement agencies couldn't notice trafficking across domestic and international borders.

C. Natural Disasters

Human trafficking increases parallel with the poverty and natural disasters. Natural disaster is an event in which the human traffickers get an opportunity to flourish their business. Entire families and sometimes whole cities are destroyed by the natural disasters such as Tsunami, earthquakes, or flood leave children without any shelter [4]. A report mentioned that about 40,000 to 70,000 children were snatched and found missing when they were roaming outside after tsunami [5].

III. INFORMATION TECHNOLOGY BASED AHTM

Human trafficking is evidently the cruelest abuse of human rights with many forms as modern slavery across the world. AHTMs require full coordinated effort among Law Enforcement Agencies and Non-Governmental Organizations (NGOs) and other public institutions throughout the world. Even though there is currently a very little sharing of information due to the wide distribution of NGOs addressing the problem, the difficulty of communications in remote areas, low levels of use of Information Technology (IT) in related groups as anti-trafficking measure capacity, and the hesitancy to share sensitive information over insecure channels, many non-profit and non-governmental organizations committed to develop and support various regional programs to address human trafficking throughout the world. Nevertheless these organizations all together support progressive IT-related proposals to expand the level of information synchronization across various networks working in the region. However these initiatives are limited to provide awareness regarding the issue to general public and political authorities.

For instance developments of online portals on human trafficking are the most prominent use of information technology as AHTM. These portals provide information regarding missing persons, laws and regulations for AHTM, annual reports of demographics, and information of service providers (governmental and non-governmental networks) to victims, potential victims, survivors and families of them.

Computerized Population Registration (CPR) is efficiently being use in controlling international borders. However in many countries, the traffickers appear to innocent villagers as successful traders and convince the parents that their children could earn handsome money in big cities. The traffickers sell the victims to brokers who traffic them to neighboring countries for forced labor. Till the victims reach final destination, they are totally unaware of their fate (low level of education is particular reason here). Therefore even the CPR couldn't help them while crossing the borders. Even the

traders may return to same villages a number of times to hunt families with poor financial conditions.

An IT based technology, which alert the law enforcement agencies during the crossing of potential victims could suppress the human trafficking to great extent. In this study, the proposals for such IT based system are discussed.

IV. RFID CURRENT TRENDS

Michael Faraday [6] along with other scientists worked on the Electromagnetic and Radio waves in the 19th century. Radio Frequency Identification (RFID) technology is based on this study. RFID system consists of mainly three components, an antenna for scanning the signals, a transceiver along with decoder for interpretation of data, and a transponder also called as RFID Tag which contains the information of tagged person or object. When an RFID tag comes under the field of the scanning antenna, it becomes activate by the signal sensed from the scanning antenna. This signal in turns activates the RFID chip, and the tag transmits the information on its read only or read/write memory to be received by the antenna. RFID tags are of two types. Active RFID tags have build-in power source; the advantage of these tags is that the reader can easily get the signal from the long distance. RFID is used in tremendous applications such as to prevent automobile theft and merchandise, traffic management, allow to enter buildings, tolls collection without any pause, automating parking, gated communities get controlling access of vehicles, goods dispensing, ski lift access, library books tracking, air ports and corporate campuses, and the growing opportunity supply chain management to track the wealth assets. U.S. Homeland Security also uses this technology with applications such as border crossings security and intermodal container shipments [7]. With soon to be the integral part of human life, the application of RFID with human implanted tags is already under consideration to stop illegal aliens from crossing United States of America's international borders [8]. British scientist performed first experiment of RFID human implant in 1998. This test was used to open doors, switch on lights, and some small operations within the building [9].

RFID tags could not only be used to observe the legal and illegal border crossing but also to stop human trafficking [8]. An implanted human RFID tag is an integrated circuit placed in silicate glass and implanted in the human body. A sub dermal device contains a unique codes linked with the information stored in an database system outside, such as personal identification, records of medication in case of a coronal disease patient, contact information and patient medical history. In the next section, propose model of the system is explained to use the RFID as AHTM.

V. PROPOSED SYSTEM DESIGN

The proposed system as illustrated in Fig. 1 composed of the following three main components:

A. Implantable Transponder/Human Implant Tag (HIT)

The implantable transponder or Human Implant Tag (HIT) is an integrated circuit which contains radio frequency circuitry and the information required to identify the object or person. The information of the person tagged could be saved in terms of a unique code which could only be interpreted by central workstation. The code should be saved in read only mode and could be formulated similar to electronic product code which could encrypt information about person like name, residential address, national identity card number, or social security number etc. Tags are available in active and passive configurations depend upon presence or absence of battery respectively. Since the tag has to be implant in human body, passive tags will preferred. Therefore the tag must be turned on by an external power source.

Location of HIT: Usually HITs are implant on the back side of palm of right hand between index finger and thumb or in between index finger and middle figure. In few cases it is also implanted in Arm.

Implant dimension and material: The implant tag is normally 1mm in diameter and about 2mm long. Tissue bonding cap is made from the specialized plastic covered with a hermetically sealed glass capsule containing the RFID circuitry. The plastic is designed to bond with human tissue and prevent the capsule from moving around once it has been planted.

Procedure: RFID implantation is an Invasive process. It can easily be done by using latest RFID injections. The transponder chip is placed in specialized RFID injections. The tip of injection is inserted approximately 10 to 12 millimeter deep so that the implanted tag could reach the sub dermal tissues of the selected organ.

B. Reader

The antenna enables the tag to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital data. The digital data is transmitted to central workstation. The efficiency of reader in terms of distance at which it can read the tag is depended upon reader's antenna and its magnetic field strength [10]. In order to achieve long reading distances, large antenna and higher output power of reader are required. The readers should be placed on international and domestic borders.

C. Central Workstation

The central workstation (CWS) could be consists of a personal computer and a specially designed software. The software will help to store the information of potential victims and should connect the CWS to all "Readers" installed at borders. As soon as CWS receives the information of reading an implanted RFID tag by a Reader installed at international border, it will alarm the concerned forces.

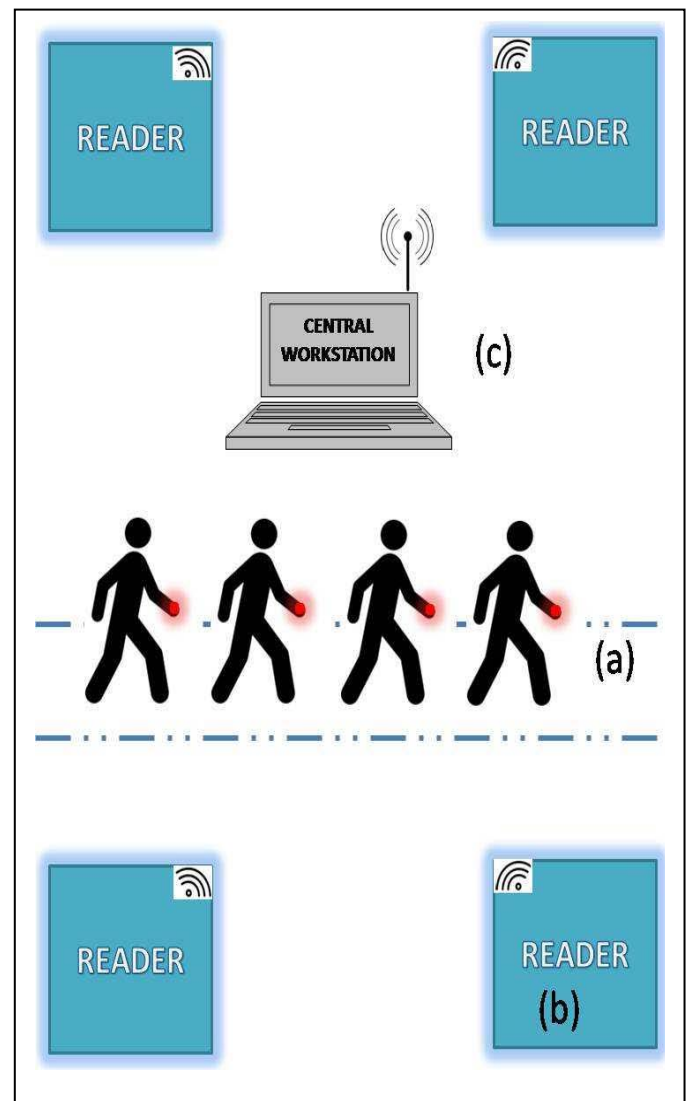


Figure 1. Illustration of RFID system as Anti-Human Trafficking Measure with main components (a) Human implant, (b) Reader and (c) Central workstation

VI. SYSTEM LIMITATIONS

A. Technical Limitations

The main limitation of this proposed system will be tag range as the readers should be installed on domestic and international borders. The tag range could be defined as the maximum distance at which RFID reader can read the tag [11]. Chip sensitivity thresholds value is inversely proportional to the distance at which the tag can be read by Reader [12]. Since the tag has to be implanted in humans, path loss will be dependent nature of surrounding tissues. Friis Formula [13] suggests that path loss is directly and inversely proportional to wavelength and distance respectively. In case of human implant tags, tissue attenuation will impact on propagation of RF signal into human body. The characterization of RF propagation in muscle tissues is a field that has been extensively studied [14].

Furthermore it is evident that skin effect is critical and noteworthy for humans at higher frequencies. Specific Absorption Rates (SAR) is defined as the rate at which the body or tissues absorb RF energy when exposed to an electromagnetic field which depends upon the time derivative of the incremental energy absorbed by, or dissipated in an incremental mass contained in a volume element of a given density [14]. The SAR for human muscle tissue is more than twice the limit of Federal Communications Commission (FCC) for safe exposure to RF energy by mobile devices [14].

B. Health Concerns

Food and Drug Administration (FDA) proved that RF Tag implantation causes strong medical problems [15]. Electrical hazards, incompatibility of MRI, reactions of tissues, and implanted chip migrations are just a few of the potential risks produced by the implantation of this device, according to a letter issued by the FDA in October 2004 [16]. A patient could be burned due to the reaction of chip and outside source which produces EMF radiation, such as a strong electrical field or a magnetic resonance imager (MRI) machine. The strong magnetic field produced in an MRI scanner is able to destroy the implant and causes the internal and external severe burns. According to the Studies performed in 1996 to 2006 in the field of Veterinary and toxicology that lab experiments of microchip implants in mice and rats sometimes causes cancerous tumors around the chips [17].

Due to the un-encryption of almost all microchips, they are very vulnerable to become detected by scanners of third-party. By scan silently, someone could get the information on a chip and make the clone of that signal, and enables the hacker to impersonate an implanted individual. This could create the criminal misuse of the information related to building entrance or computer access or access of medical account of an unrelated person. In this way the chip could easily be deactivated or removed from the person, or the information stored in the chip could be removed [18].

C. Ethical Limitations

Different scientific and professional forums give ethical criticism on implant of Chip in humans [19]. Academic groups [20], human rights organizations, government departments and religious groups are also arguing on this issue. A report published by American Medical Association in 2007 shows that the demerit of Microchip implant effect the privacy of the implanted person because the information within the chip is not surely protected, and also causes the health risks majorly due to the migration of the chip under the skin [21].

VII. CONCLUSION

Information technology should be efficiently utilized to introduce physical Anti-Human Trafficking Measures to suppress this multibillionaire business across the world. Evidently the people from third world countries are mostly the victims and potential victims of human trafficking due to poor economical and law and order situations. Children and women being the most likely the victims of the traffickers,

introduction of RFID implants as AHTM would be a cheap and efficient way to restrain the potential victims to be trafficked. As discussed earlier, a huge number of governmental and non-governmental agencies are working in this area, however none of them claims to have exact demographics of victims trafficked across international borders each year. Therefore it would not be possible to demonstrate the exact risk to benefit ratio. Although a number of ethical and social issues are attached in use of RFID implants, but it should be understood that in third world countries illiteracy and poor economical conditions provides traffickers a healthy place for their business. Furthermore human implants could be more optimized and innovate to fulfill the health concerns. Advance biomaterial technology could help to develop implant with minimal side effects. RFID range is a major issue in terms of coverage but at the same time, it is beneficial for the privacy of individual persons within their hometowns.

Any AHTM could not block trafficking hundred percent, but use of RFID technology in this area will definitely improve the current situation and could efficiently take part in securing lives of potential victims.

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